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PALMAE MALESICAE<sup>1</sup>

## III.—Notes on some Malaysian Calami

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The results embodied in this paper were obtained mainly during a study undertaken by me in order to make myself familiar with the technique of describing and classifying the lepidocaryous palms of the Old World. A preliminary attempt to study these palms was made at the Botanic Gardens, Singapore, but as the Singapore herbarium does not possess representative specimens of some of the groups into which Beccari has divided the genera of these palms and also as very little material from the Singapore herbarium was seen by Beccari <sup>(2)</sup> a man to whom systematists owe more than to anybody else for bringing order into the classification of these palms which were previously in a maze of regular confusion—I was not able to make much headway in this my undertaking. I therefore made a second attempt, at the herbarium of the Botanic Gardens, Berlin, and as a result I have been able to prepare this paper. The success this time was due largely to the fact that I had a free access to the Berlin herbarium which possesses much authentic material carefully arranged by Prof. M. Burret, from all parts of the world where *rattans* grow. After completing the main part of my inquiry into these palms in Berlin, I was able to verify the accuracy of many of my conclusions and results in the herbaria of the Royal Botanic Gardens, Kew, and of the British Museum, London. My thanks are therefore due to the Keepers of all the three herbaria, and also to Prof. H. Harms and Prof. M. Burret of Berlin who were ever ready to help me with advice whenever I found myself in any difficulties.

Seventeen species of *Calamus* are discussed in this paper, of which the following 8 are new: *C. orthostachyus*, *C. conjugatus*, *C. dachangensis*, *C. Kiahii*, *C. Kjellbergii*, *C. rostratus*, *C. stramineus* with its var. *megalospermus* and *C. tenompokensis*. Of these new species, *C. orthostachyus* and *C. Kjellbergii* are from Celebes and the rest from Borneo i.e. *C. conjugatus* from Mt. Matang and the remaining five from the Kinabalu Mountain Range. This

1. *Palmae Malesicae I* in Fedde, Repertorium XXXV (1934) 273-283; *II* in Gard. Bull. S. S. VIII (1935) 159-163.

2. Much of the Singapore material was worked out by Ridley who had his own system of classifying the Lepidocaryae palms. This system is much less satisfactory than that of Beccari and it is unfortunate that Ridley did not adopt Beccari's system when preparing his Flora of the Malay Peninsula V published in 1925.

opportunity is also used to supplement the somewhat inadequate description of *C. Burkillianus* that has been published and to describe its male plant which was not known before. This species has also been recorded from another island, Pulau Kapas, lying to the north of the Tioman island (on the East coast of the Malay Peninsula), whence the species was originally described. Similarly the female plant of *C. kandariensis* (from Celebes), a species known only from a male plant, has been described. Reasons have been adduced to keep *C. diffusus* distinct from *C. Oxleyanus* and to reduce *C. pauciflorus* to *C. filipendulus*, *C. distans* to *C. luridus* and *C. Hewittianus* and *C. Jaherianus* to *C. myriacanthus*. *C. longisetus* was not recorded for the Malay Peninsula, though it was described from the Andamans and South Burma as far south as Tenasserim; but I have detected that this species has been collected twice in Langkawi island by Haniff and that it has been wrongly referred by Ridley to *C. arborescens*. The confusion that had crept over *C. luridus* and *C. muricatus* owing to the misidentification of specimens by Ridley has been cleared. Already Beccari had pointed out that the specimens of *C. laxiflorus* and *C. scabridulus* had been wrongly determined by Ridley as *C. luridus* [cf. Beccari in *Ann. Roy. Bot. Gard. Calc.* (quoted hereafter as *Calcutta Annals* or *Calc. Ann.*) XI *Suppl.*, 1913 pp. 13 and 33]. I have now found that some specimens identified by Ridley as *C. luridus* are really *C. muricatus*. As a result, the range of *C. muricatus*, which was regarded as endemic in Borneo is extended to the Malay Peninsula, while that of *C. luridus* which, on the authority of Ridley, was believed to occur also in Borneo (cf. Merrill, *Enum. Born. Pl.* 1921, p. 75) has become restricted to the Malay Peninsula only. *C. polystachyus* was hitherto considered to be native of Sumatra. The possibility of this record being wrong has been pointed out, while the species has been shown to occur as native in Sandakan, Borneo. Its fruits are also described for the first time.

It may perhaps be not out of place to draw the attention of botanists to some of the defects I have noticed in the recent collections and descriptions of the species of *Calamus* and *Daemonorops*. An inspection of some of the recent collections in the various herbaria I visited in Europe shows that the importance of the leaf-sheaths for the classification of these palms has not been understood by most of the recent collectors, though about three or four decades ago Beccari had written to demonstrate their importance and had later developed this thesis at length in his monographic studies published in the *Calcutta Annals* XI (1908) and XII (1911). There is many a species awaiting a critical study to clear its taxonomic status or position and though the

species has been re-collected in recent years, yet nothing further can be done because collectors have not made any attempts to secure better material to show its leaf-sheaths. Further it is important that collectors should record in the field-labels whether the leaves of a particular *rattan* terminate in a cirrus or not, noting at the same time its length when present; for from the leaf fragments that are usually preserved in herbaria it is not always possible to say whether a particular species bears a long or merely a short, abortive, cirrus to the leaves and this character very often affords a good clue in recognising the group to which a given *rattan* belongs. I have come across cases where, while the specimen from a principal set contains only the male organs, the specimens in the secondary sets distributed to other herbaria and purporting to be the exact duplicates of the former and therefore bearing the same field number, contain female spadices or spikelets and no male; or *vice-versa*. Neither of the specimens give a clue to show whether or not these specimens were derived from one and the same plant. If both sorts of flowers are found on one and the same plant, it is desirable to include both kinds of flowers in one specimen. If different sexes are produced by different plants, then the specimens derived from the male plant should bear a different number from the ones taken from the female, and a note should be inserted in the field label to show whether both the sexes were represented in one group of plants growing together as if in a clone, or in different groups. It is therefore highly desirable for the institutions which send or support expeditions where *rattans* are indigenous, to give the collectors the necessary instructions on this matter so that the future collections may not suffer from the same defects as the ones made when these palms were very little understood and when botanists themselves did not know what parts were of diagnostic importance for these palms.

I have also noticed an unfortunate tendency to omit in the description of *rattans* to make any mention of the characters regarding the terminal leaflets (whether free or connate), the apex of the primary spathes (whether prolonged into a long, ear-like lobe and dilated in the upper parts, or tubular and truncate, or lacerate or not, etc.), spadix branches, spikelets and involucrophore (whether sessile or pedicelled), perianth (pedicelliform or not), etc. I call this tendency unfortunate because such characters are of great diagnostic value to distinguish most of the *rattans* and to find their affinities as has been amply demonstrated by Beccari (*op. cit.*). In the remarks made under *C. luridus*, I have pointed out the utter uselessness for practical



systematics to take into consideration the number of the **transverse series** of the scales on the *rattan* fruits. If the number is to be given, then it should refer to the longitudinal series.

A numerical list of the specimens cited in this paper is appended to show the species under which they are enumerated.

✓ 1. *Calamus orthostachyus* Furtado spec. nov.

*Caudex* scandens, circ. 8 m. longus. Frondis *vagina* spinis ad 0.8 cm. longis, basi dilatatis armatissima, infra petiolum gibbosa. *Ochrea* brevis ut videtur. *Petiolus* basi eomodo armatus, altera parte non visus. *Frondes* cirrhiferæ, secus rhacheos dorsum unguibus ad 5-fidis armatæ, parte pinnifera circ. 60 cm. longa. *Cirrhus* circ. 70 cm. longus, unguibus ad 5-7-fidis præditus. *Segmenta* plurrima, æquidistantia, glabra, 2.5-3 cm. inter se dissita, ad 25 cm. longa, 1.5 cm. lata, linearia, basi subito contracta, apicem versus sensim attenuata, acuminata vel fere filiformiter acuminata, apice in margine setosa, secus costam mediam setis ad 1 cm. longis utrinque prædita. *Spadix* foemineus erectus ut videtur. *Spathae primariæ* (?) brevissimæ, cylindracæ, inermes, 1-2 cm. longæ, dorso elongatæ, acutæ. *Spathae secundariæ* et *tertiariæ* ad annulum brevissimum reductæ, dorso triangulariter productæ. *Rami primarii* (?) rigidi, ad 18 cm. longi, utrinsecus spiculas 8 gerentes, axi interjecta fere terete. *Spiculæ* 4-8 cm. longæ, utrinsecus fructus 10-19 gerentes, fere patentes. *Involucrophorum* pedicelliforme vel subpedicelliforme. *Involucrum* leviter concavum. *Perianthium* fructiferum pedicelliforme, calyce corollæ acquilongo, apice trifido. *Fructus* ovato-oblongus, basi rotundatus, apice contractus, rostratus, cum rostro atro 0.2 cm. et perianthio 0.2 cm. longo omnino 1.3 cm. altus, 0.5 cm. in diam. *Squamæ* stramineæ, secus marginem atropurpureæ, dorso canaliculatæ, in orthostichis 15 dispositæ. *Semen* nigrum, oblongum, 0.6 cm. longum, 0.3-0.4 cm. latum, 0.25-0.3 cm. crassum, rhaphen secus paulo elevatum, ceterum leviter rugosum vel non. *Albumen* album, homogenum. *Embryo* basilaris. *Spadix* masculus juvenilis tantum visus, ut foemineus.

CELEBES: on Bœlœ (=Mountain) Parema, alt. circ. 4,300 feet, in rain forest. (Kjellberg No. 2649. Type in the Berlin Herbarium).

The collector notes that the leaf-sheath is provided with thorns and the leaves have a long cirrhus.

In the specimen in Kjellberg's herbarium there is a terminal portion of a male spadix bearing the same number as the female specimen in Berlin. The collector does not



state whether this male portion was obtained from the same plant as the female one. The male portion of the spadix is quite similar in structure to the female, and the species would therefore appear to fall in *Group XV\** of Beccari. But the erect spadix with its reduced spathes and with its somewhat pedicelliform involucrophorum distinguishes it at once from all the other species of *Calamus* known to me. In these respects it resembles very much some of the *Calamus*-like species of the genus *Daemonorops*, but the pedicelliform perianth with its calyx equal to corolla and the homogeneous albumen make one assign the species to the genus *Calamus*.

**2. *Calamus Burkillianus* Becc. ex Ridl. Flor. Mal. Pen. V (1925), 56. Planta mascula.**

*Caudex* scandens. Frondis *vagina* straminea, infra petiolum gibbosa, aculeis solitariis, applanatis, basi dilatatis, apice obscurioribus vel non, 0.8-1.5 cm. longis. *Ochrea* brevis, extus hispida, trichomatibus longis, rigidis, sinuosis, adpressis, deciduis, ferrugineis. *Petiolus* circ. 30-45 cm. longus ut videtur, stramineus, leviter furfuraceus, furfuro griseo vel brunnescenti, fugaceo, super applanatus vel concavus, ad 1 cm. latus, subtus convexus, aculeatus vel non, secus margines aculeis solitariis distantibus præditus. *Rhachis* subtus aculeis solitariis armata, non cirrhifera. *Segmenta* plurrima, equidistantia, alternantia vel subopposita, 2-5 cm. inter se dissita, lineari-lanceolata, 25-35 cm. longa, 1.5-1.8 cm. lata, in apicem ad margines spinulosam terminata, costis 3 percursa, costa media robustiore apicem versus subtus setosa, alteris supra eodemmodo armatis, subtus glabris, segmenta terminalia ambo basi connata. *Spadix masculus* longe flagelliferus, unguiculatus, tenuis, duplo vel sub-triplo ramificatus. *Spathae primariae* tubulosæ, aculeolatae, apicem versus fissæ, summo truncatae; *secundariae* et *Spathellae* membranacæ, fusco-tomentosæ, truncatae. *Rami primarii* nonnihil supra spatham orientes, 20-25 cm. longi, ramis secundariis utrinsecus ad 10, alternantibus; *rami tertiarii* abbreviatissimi 1 cm. usque longi, flores circ. 8 gerentes. *Corolla* 0.4 cm. longa, calyce duplo longior.

**MALAY PENINSULA: Female specimens:** *Pulau Tioman* off the Pahang Coast, Joara Bay (Burkill, s. n. in June, 1915. Type). *Tringgau*, *Pulau Kapas* (Holtum, 15211). **male:** *Pulau Tioman*, Ayer Batang (Henderson, 18465).

Material of this species was submitted to Beccari who had proposed the above name, but it was never published by him. Since the specific description given in the *Flora* was entirely drawn by Ridley, I think the species ought to be accredited to Ridley and may be quoted as above.

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\* In *Calcutta Annals* XI, 1908.

I have described the male plant at some length in order to supplement the inadequate description of Ridley. It may also be added that the involucrophorum is not pedicelliform and that the fruiting perianth is explanate. The scales are arranged in 15-16 longitudinal series on the fruits, though Ridley gives only 10 as the number of rows (cf. my remarks on *C. luridus* re counting of these rows). The species belongs to the *Group V Section B. 1* of Beccari in the *Calcutta Annals* and is perhaps allied to *C. siamensis* and and *C. pseudotenuis*. Judging from the plate 95 given by Beccari (*Calc. Ann. XI*, 1908, p. 266), this species could be easily confused with *C. horrens* Bl. a species described from a sterile specimen; but its ocrea is described as glabrous and the terminal leaflets free to the base. Recent fruiting and and flowering material from the type region seems to show that *C. horrens* is a form of *C. tenuis*, a species with a distinct pedicelliform perianth (*Calc. Ann. XI Suppl.* 1913, p. 39).

✓ **3. *Calamus conjugatus* Furtado spec. nov.**

*Caudex* erectus (vel semi-scandens?), gracilis, 0.5-0.8 cm. (sine vagina 0.4-0.5 cm.) in diam. Frondis *vagina* fusca, infra petiolum leviter gibbosa vel non, apice oblique truncata, corrugationibus annularibus, interdum interruptis, transversis interdum obliquis, gracilibus, 1-2 mm. inter se remotis, secus marginem fimbriatis vel verruculosus, verruculis interdum pungentibus. *Ochrea* brevis, corrugata. *Petiulus* gracilis, 10-15 cm. longus, 0.2 cm. crassus, ima basi extus eodemmodo corrugatus, ceterus lævis vel spinulis aut verruculis sparsis, obscurissimis præditus, supra canaliculatus, apice in cirrhum abortivum 1-1.5 cm. longum, subtus aculeis robustiusculis, solitariis, deflexis armatum transiens. *Segmenta* gemina, opposita, patentissima elliptico-lanceolata, glabra, 5-6 costulata, apicem versus quam basin magis attenuata, ima basi abrupte contracta, plicatula, secus marginem apicum setulosa. *Spadix foemineus* circ. 35 cm. longus, ramis primariis 4, ad 6 cm. longis, sessilibus, utrinsecus spiculas 4, alternantes, ad 1.5 cm. longas gerentibus. *Spathae primariae* tubulosæ, apice oblique truncatæ, spinulis vel verruculis sparse armatæ, vel scabridæ. *Spathillae* et involucra scabridæ. *Involucrophorum* sessile. *Flores, fructus* et spadices masculi ignoti.

BORNEO: Matang (Ridley, in July, 1903. Type in Singapore).

From the characters observed this species falls in Beccari's *Group V, Sect. A* and appears to be a close ally of *C. zonatus* Becc. under which name the species was distributed by Ridley. It is however easily distinguished from the latter by its leaves which bear only one pair of

spreading, opposite, elliptic-lanceolate leaflets growing at right angles to the rachis, whereas in *C. zonatus* the leaves are divided into many, linear leaflets which are moreover porrect and not spreading. *C. flabellatus* Becc. placed by Beccari in *Group V, Sect. B* has also a pair of leaflets which are, however, porrect and connate at base, while it has a sheath which is quite unarmed and destitute of any transverse corrugations. *C. digitatus* which sometimes also produces unijugate leaves differs from the species here described by its leaflets being oblong-spathulate, abruptly contracted at the apex and connate at base, and by the presence of distinct spines and the absence of any transverse corrugations on the sheaths. *C. corrugatus* which in corrugations and the shape of leaflets approaches somewhat *C. conjugatus* is easily distinguished from the latter by its many-jugate leaves and by its short, hairy-furfuraceous petiole.

✓ 4. *Calamus dachangensis* Furtado spec. nov.

*Caudex* scandens, circ. 3-7 m. longus, sine vagina 1.2-1.4 cm. in diam. Frondis *vagina* flagellifera, infra petiolum gibbosa, oblique truncata, setis basi intumescens, tennuibus vel robustioribus dense oblecta, inter quas aculeis rigidis, ad 0.8 cm. longis, leviter reflexis, solitariis vel confluentibus prædita. *Ochrea* brevissima, extus ad marginem iisdem setis ut in vagina. *Fronde* cirrho carentes, cum petiolo circ. 45 cm. longæ, utrinsecus segmentis circ. 30. *Petioli* 10-15 cm. longus, supra applanatus, aculeis sparsis brevibus, subtus convexus, aculeis in margine uti supra, in dorso majoribus armatus. *Rhachis* dorso aculeis solitariis vel trifidis sparsis prædita, utrinque decidue ferrugineo-floccosa. *Segmenta* ad 30 cm. longa, 1.5 cm. lata, acquidistantia, 1-1.5 cm. inter se dissita, (apicalia breviora, libera vel basi paululo confluentia), subopposita vel alternantia, linearia, ad margines setulosa, e basi nonnihil plicata in apicem sensim attenuatum, acuminatum summo setis paucis præditum producta, subtus tomento floccoso ferrugineo deciduo oblecta, costis supra 3 distinctioribus, quarum media robustiore, longe-setosis (setis=1 cm. longis), subtus sat obscuris, media parce spinulosa. *Spadix* foemineus cum flagello apicali circ. 2 m. longus, duplo ramificatis, infra parce et breviter armatus, in parti terminali valide unguiculatus. *Rami primarii* 2-4, glabri, ad spatharum orificium orientes, 8-15 cm. longi, rami secundarii floriferi, sessiles, 5-6 cm. longi, floribus in seriebus duabus dispositis, secundis, utrinsecus 4-7. *Spathae primariæ*: infima anceps, glabra, in marginibus aculeolata, oblique truncata; superiores teretiusculæ, inermes vel aculeatæ, glabræ, oblique truncatæ. *Spathae secundariæ* et tertiariæ (=spathellæ) infundibuliformes, glabræ,



truncantæ. *Involucrophorum* distincte pedicilliforme; *involucrum* disciforme. *Perianthium* floriferum circ. 0.4 cm. longum, calyce corollæ æquilongo; fructiferum pedicelliforme, basi truncatum, apicem versus contractum, dein in lobulos dilatatum. *Fructus* elongato-ellipticus, utrinque rotundatus apice abrupte mammillatus, cum mammilo 0.1 cm. et caudiculo 0.1-0.15 cm. longo, 1.6-1.8 cm. altus, circ. 1 cm. in diam. *Squamæ* stramineæ, secus marginem fuscae, in seriebus verticalibus 17-18 imbricatæ. *Semen* dense resinatum, lineari-oblongum vel oblongum, utrinque rotundatum, in latere foveali nonnihil applanatum, fovea chalazali elongata, sulcis vel plicis irregularibus radiantibus ad embryonem in altero latere situm convergentibus, 1.2-1.4 cm. altum, 0.5-0.8 cm. latum, 0.4-0.6 cm. crassum. *Albumen* in parte exteriori fuscum, resina nigricans, leviter ruminalum vel sulcatum, sulcis resinosis. *Embryo* fere basilaris vel ad latus proxime basin situs.

*Planta mascula* ut fœminea, differt spadice graciliore, calyce quam corolla 0.5 cm. longa duplo brevior.

BRITISH NORTH BORNEO: Mt. Kinabalu, on *Gunong Dachang*, alt. circ. 11,000 feet, (legit Furtado, comm. Clemens sub no. 29, 198, female. Type in Singapore), *ibid* (leg. Furtado, comm. Clemens sub num. 29, 198a male and female; may have been mixed during drying).

This belongs to *Group X* of Beccari and is very closely related to *C. exilis* Griff., from which, however, it differs in its leaf-sheaths being more thorny, in the absence of scabrid hairs or beard on the leaf-rachis, spathes and spadix-axis, in the perianth being somewhat contracted at the mouth of the tube and not distinctly campanulate, and the leaflets bearing thick ferrugineous tomentum beneath and long setæ in the upper surface of the 3 principal nerves. In *C. dachangensis* the leaflets appear also broader and the fruits more rounded at the apex and the base.

From *C. Gibbsianus* Becc. which resembles this species in many respects and which also belongs to the *Group X*, *C. dachangensis* is easily distinguished by its greater number, closer and equidistant leaflets.

The stem is used to a certain extent by the Dusuns in wicker work, though they seldom visit the locality as it lies too far out of their way and also in the higher and therefore colder altitudes. Perhaps this *Calamus* has the same value as *C. Gibbsianus* or any of its allies growing at Kamborangah. The altitude of the Gunong Dachang may also be the same as that of Kamborangah. Dachang is not included in the maps I have consulted.

- ✓ 5. *Calamus diffusus* Becc. in Hk. f. Flor. Brit. Ind. VI (1892), 447; Ridley Mat. Flor. Mal. Pen. II (1907), 209; stat. nov.

*Gardens Bulletin, S.S.*

✓ *C. Oxleyanus* T. & B. *sensu* Ridl. Flor. Mal. Pen. V (1925), 62, quoad synonym *C. diffusus*, **syn. nov.**

This species was based on very imperfect material collected by Thomas Lobb in Singapore, consisting, as described originally by Beccari, of many equidistant, linear-lanceolate leaflets with clawed, non-cirrhiferous (always ?) rachis and strongly clawed [and therefore flagelliferous] male spadix. Probably because the spadix is somewhat similar to that of *C. Oxleyanus* and perhaps because the species has not been recorded again even in Singapore, the type locality, Beccari was later led to the conclusion that the spadix belonged to *C. Oxleyanus*, a conclusion recorded by him in the *Calcutta Annals* XI, 1908, p. 450, but he did not express any opinion regarding the leaf. In the *Flora*, Ridley relegates the entire species with spadix and leaves as a synonym of *C. Oxleyanus*, though he himself had remarked previously (*Materials*, II, 1907, p. 209) that *C. diffusus* is distinguished from *C. Oxleyanus* by its equidistant leaflets, while the latter has leaflets arranged in groups. After examining the type of *C. diffusus* in Kew, I came to the conclusion that it should be kept as distinct until one finds himself in a better position to determine its exact status. On my return to Singapore, I found that the material collected by Ridley under No. 11215 in the Batu Pahat district of Johore, and quoted by Ridley under *C. Oxleyanus* agrees very well with the description of *C. diffusus*, though the specimen is female. The leaf is young, is not provided with a cirrhus and has equidistant leaflets such as described for the species; and perhaps a further comparison may show that *C. laxiflorus* Becc. is also the same species. At any rate the conclusion seems to be clear that *C. diffusus* is not *C. Oxleyanus*, at least as far as the leaves are concerned.

✓ 6. *Calamus filipendulus* Becc. in Hook. f. Flor. Brit. Ind. VI (1892), 443; Rev. Bot. Curv. Ind. II (1902), 202; Calc. Ann. XI (1908), 188, pl. 45; Ridl. in Mat. Flor. Mal. Pen. II (1907), 193; Journ. F.M.S. Mus. IV (1909), 87; et Flor. Mal. Pen. V (1925), 51.

✓ *C. pauciflorus* Ridl. Flor. Mal. Pen. V (1925), 56, **syn. nov.**

Ridley's species is slightly less scabrid than some of the duplicates of the syntypes of *C. filipendulus* collected by Kunstler and preserved at Kew. In the *Key* given by Beccari in the *Calcutta Annals*, *C. filipendulus* should have been included in the *Section A of Group V*, among the species numbered 24-27 and not in the *Section B*, for the secondary spathes, spathelets, etc., in this species are conspicuously scabrid. The *Key* given by Ridley in his *Flora* is rather difficult to follow and it is no wonder that Ridley

failed to recognise *C. filipendulus* in his *C. pauciflorus*. The following records should be added to those already given by Beccari.

MALAY PENINSULA: *Pahang*: Telom Ridge (Ridley, 13921). *Perak*: Jor near Tapah (Haniff 14252); Tapah, at Pahang Road, 10th mile (Burkill and Haniff, 13446, and 13451, Syntypes of *C. pauciflorus*).

**7. *Calamus kandariensis* Becc. Planta fœminea.**

*Caudex* scandens, circ. 5 m. longus. Frondis *vagina* inermis, longitudinaliter striata, infra petiolum gibbosa, apice oblique truncata. *Petiolus* 10 cm. circ. longus, supra convexo-applanatus, aculeis brevissimis, ad 0.2 cm. longis, dispersis præditus, subtus convexus secus margines aculeis 0.2-0.3. cm. longis, reflexis, solitariis armatus, utrinque dense griseo-tomentoso-furfuraceus. *Rhachis* sine cirrho circ. 52 cm. longa, in parte basilari in eodemmodo descripto vestita, subtus aculeis et unguibus armata, utrinsecus segmentis 7-8. *Segmenta* 3-4 costulata, secus costas paulo plicata, infima solitaria, alternata; reliqua ad 2 aggregata, opposita vel subopposita, 12-15 cm. inter se remota, lanceolata, circ. 25 cm. longa, 3-4 cm. lata, supra viridia, subtus glauca, apice contracta, acuta, subulata vel non, utrinque inermia et basi decidue griseo-furfuracea. *Cirrhus* circ. 65 cm. longus, subtus unguiculatus. *Spadix foemineus* 0.75-1 m. longus, apice parte sterili 10 cm. longa, reflexo aculeolata terminatus. *Spathae primariae*: ad 15 cm. longæ, cylindrico-tubulosæ, striatæ, inermes vel dorso aculeolatæ, apice oblique truncatæ, basi contractæ, sensim in axin ipsam transeuntes. *Spathae secundariae* cylindricæ, striatæ, inermes, glabræ, apice oblique truncatæ. *Spathellae* tubulosæ, striatæ, truncatæ, dorso in apicem triangularem productæ. *Rami primarii* nonnihil supra spatharum apicem orientes. *Spiculæ* 2.5-4 cm. longæ, in ramis primariis alternantes, circ. 1.5-3 cm. inter se remotæ, nonnihil supra spathas insertæ, utrinsecus fructus 4-6 gerentes. *Involucrophorum* pedicelliforme; *involucrum* disciforme. *Perianthium* fructiferum pedicelliforme. *Fructus* immaturi tantum visi, oblongi, fere cylindrici, apice abrupte rostrati, cum rostro 0.2 cm. et perianthii tubulo 0.1 cm. longo 1.4 cm. altus, 0.5 cm. in diam. *Squamæ* badiæ, unicoloratæ vel marginem secus paulo obscuriores, in orthostichis 13-15 dispositæ. *Semen* juvenile. *Albumen* paulo ruminatum ut videtur. *Embryo* basilaris.

CELEBES: Karebbe, by the Malike River, circ. 150 feet alt. (Kjellberg, 2398 in Kjellberg's herbarium in Sweden, and in Berlin).

The collector's field notes state that this *Calamus* is a liane about 5 meters long growing along the river banks and that it is seldom found in flowers or fruits.



Though the plant here described bears larger, but fewer and more distant leaflets to the leaf which, moreover, become, on drying, greenish above and glaucous beneath (not brown as in the type), I think this plant is a female of *C. kandariensis* the type of which was also from the Celebes. Variations in the size of the leaflets and in their number on a leaf depend very largely on the age and vigour of the plant and sometimes even on the sex, while the colour depends on the habitat, vigor and the mode of drying. Unless therefore one gets a series of material of both the male and female plants, one cannot decide whether a certain plant is typical or represents a varietal form of a species. The spathes are somewhat inflated like those of the male spadix. There is no doubt that this species belongs to Group XII of Beccari as defined in the *Calcutta Annals*.

✓ 8. *Calamus Kiahii* Furtado spec. nov.

*Caudex* scandens, circ. 7 cm. longus, sine vagina 1-1.5 cm. in diam. Frondis *vagina* flagello carens, infra petiolum gibbosa, aculeis 1-1.5 cm. longis, robustis, horizontalibus, basi intumescentibus, dispersis, solitariis vel confluentibus armata, apice oblique truncata. *Ochrea* brevissima, apice in ligulam circ. 1 cm. longam reducta. *Frondes* cum petiolo cirrhoque 1.5-2 m. longæ, utrinsecus segmentis 7-9. *Petiolus* 5-12 cm. longus, supra ad basin leviter canaliculatus. *Rhachis* in parte pinnifera circ. 80 cm., in cirrhifera circ. 70 cm. longa, subtus aculeata; aculeis in parte basilari solitariis, in altera parte trifido-unguiformibus. *Segmenta* plerumque bina, per greges 3-4 remotos alternantes vel suboppositos disposita, lanceolata, coriacea, concoloria, 5-7-costata, nervos sub-secundarios sat obscures secus plicata, glabra, media maxima, circ. 23 cm. longa, 2.2-2.7 cm. lata, maxima latitudine supra mediam partem sita, basi longe alternata, apice acuminata et ad margines spinulosa nervulis, transversis distinctiusculis. *Spadix foemineus* circ. 40-50 cm. longus, ramis primariis 3-5. *Spathae primariae* aculeis recurvis parce armatae, infundibuliformes, oblique truncatae, lepidibus piliformibus ferrugineis obtectae, orificio ciliolatae. *Spathae secundariae* et *tertiariae* similes, truncatae, inermes, ferrugineo-lepidotae. *Rami* primarii et secundarii ad spatharum orificium orientes; secundarii flexuosi, circ. 5 cm. longi floribus 6-9 distantibus, distichis. *Involucrophorum*, sessile. *Involucrum* cupuliforme. *Perianthium* pedicelliforme, 0.3 cm. altum, corolla calyce æquilonga. *Fructus* ovoideus vel subglobosus cum rostello apicali 0.2-0.3 cm. et caudiculo basali 0.2-0.3 cm. longo, 2 cm. longus, circ. 1.2 cm. in diam. *Squamulae* stramineae, series 18 verticalibus imbricatae, ad margines badiæ. *Semen* ambitu obovatum vel potius elongato-obovatum, basi attenuatum et acutum, apice rotundatum interdum obscure

apiculatum, lateribus basin versus compressis, 1.4 cm. circ. longum, 1 cm. latum, 0.8 cm. crassum. *Rhaphe* elongata. *Albumen* profunde ruminatum. *Embryo* lateralis, modice infra dimidium latus, nonnihil supra basin situs.

BRITISH NORTH BORNEO: Mt. Kinabalu, at Lumu-Lumu, circ. 6,000 feet alt., (leg Furtado, comm. Clemens, sub. no. 29195. Type in Singapore).

This species belongs to Beccari's *Group XV B.* and is related to *C. caesi* Bl., from which it (*C. Kiahii*) can be easily distinguished by its much narrower, lanceolate (not oblanceolate), coriaceous, concolorous leaflets, by its straight (not reflexed) more closely placed spines on the sheath and by its lepidote spathes. The seed of *C. caesi* is described to be ovoid or to have a rounded base and subacute apex, but in *C. Kiahii* the seed is oblong or obovate with broad apex and often a narrowed base.

Named in honour of Kiah bin Haji Salleh, the plant collector of the Botanic Gardens, Singapore, who accompanied me on my trip to the Kinabalu Mountains in 1932.

✓ 9. *Calamus Kjellbergii* Furtado spec. nov.

*Caudex* scandens, circ. 5 m. longus, sine vagina 1.5 cm. in diam. *Fronde*s ut videtur longæ, cirrho circ. 1.20 m. longo. *Vagina* spinis brevissimis vel indistinctis, distantibus armata, infra petiolum gibbosa, apice oblique truncata. *Ochrea* brevissima, inermis. *Petiolus* partim tantum visus infra convexus, dorso et margines secus eomodo armatus, supra concavus vel applanatus, spinis brevibus præditus. *Rhachis* dorso unguibus validis 3-4 fidis, apice fuscis et aculeis reflexis armata. *Segmenta* alternantia circ. 15 cm. remota, utrinque attenuata, basi angustata, apicem versus sensim vel subito acuminata et secus margines spinulosa, summo breviter bifida, utrinque glabra, pluricostulata, secus costas sat plicata, 37.5 cm. longa, 5.5 cm. lata; costa media validiuscula, secundariis et tertiariis tenuioribus, fere æqui crassis. *Spadix* foemineus quam frondes brevior et non flagelliferus ut videtur. *Spathae primariae* tubulosæ, ancipites, dorso carinatae, spinis brevissimis præditæ, circ. 12 cm. longæ, apice oblique truncatæ, in apicem acuminatissimam productæ; *secundariae* tubulosæ, infundibuliformes, inermes, glabræ, basi ancipites, apice oblique truncatæ. *Spathellae* spathis secundariis consimiles, apice sæpe ciliolatae. *Rami* primarii circ. 25 cm. longi, sessiles vel subsessiles, circ. 10 spiculis ferentes, in appendiculum 2 cm. longum, inerme exeuntes. *Spiculae* sessiles, (=ad spatharum orificium orientes), usque ad imam basin fructiferæ, 2-3.5 cm. longæ, utrinsecus fructibus 3-4. *Involucrophorum* sessile, apice cupuliforme. *Involucrum* late pateriforme, in involucrophoro fere inclusum. *Perianthium* fructiferum

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explanatum, 0.8 cm. in diam., concavum, calyce corollæ æquilongo. *Fructus* depresso globosus, apice abrupte nonnihil rostratus, cum rostro 0.3 cm. longo 1.7 cm. altus, 1-1.1 cm. in diam. *Squamæ* badiæ, secus marginem fuscæ, dimidiam secus canaliculatæ, in seriebus verticalibus 18 imbricatæ: *Semen* globosum, 0.7 cm. in diam, rhaphe haud impressa, sublæve, ceterum cerebriformiter alveolatum. *Albumen* ad  $\frac{1}{4}$  diam. circ. ruminatum. *Embryo* basilaris.

CELEBES: Kawata, by the river Maliki, in rainforest, alt. circ. 650 feet (Kjellberg, No. 2367. Type in Berlin and with Kjellberg in Sweden). Ripe fruits are eaten by the local people.

This species belongs to the *Group XV-A* of Beccari and is very closely related to *C. arugda* Becc. from the Philippines, which however is described as having its leaflets bearing spiny margins and sometimes spinulous costæ above, its female flowers usually geminate in the lower part of the spikelet and the fruit scales in 15 longitudinal rows and not channelled along the middle. *C. Kjellbergii* on the other hand, exhibits no traces whatsoever of any geminate female flowers (only fruiting material was available for examination), has its fruiting scales arranged in 18 vertical rows and channelled along the middle, and bears leaflets which have spinules only along the margins of their apical portions.

10. *Calamus longisetus* Griff. in Calc. Journ. Nat. Hist. V (1844) 36, et Palms Brit. Ind. (1850) 44, t. 189 AB; Becc. in Calc. Ann. XI (1908) 134, pl. 9.

✓ *C. arborescens* Griff. sensu Ridl. Journ. Roy. As. Soc. Str. Br. 59 (1911) 215, et Flor. Mal. Pen. V (1925) 64, quoad specimen lankawiense. **syn. nov.**

MALAY PENINSULA: Langkawi *sine loc.*, (Haniff. in Sept., 1900 male). *Gunong Raya* (leg. Haniff, comm. Ridley sub. n. 15910 female).

This extends the distribution of this species which was hitherto recorded only for the Andamans and South Burma as far south as Tenasserim. It is easily distinguished from *C. arborescens* with which Ridley had confused it, by the disposition of the leaflets in definite groups at least in the lower portion of the leaf, by the absence of white or glaucous substance in the nether surface of the leaflets and by the presence of flagellum to the spadix.

✓ 11. *Calamus luridus* Becc. in Hk f. Flor. Brit. Ind. V (1892) 445; Ridl. Mat. Flor. Mal. Pen. II (1907) 198, pp. (*ex altera parte*=*C. laxiflorus*, *C. muricatus* and *C. scabridulus*), et Flor. Mal. Pen. V (1925) 56, pp.

✓ *C. distans* Ridl. Flor. Mal. Pen. V (1925) 56, **syn. nov.**

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I have compared the types of Ridley's species with the duplicates of the syntypes of *C. luridus* preserved at Kew and find no material difference to give an independent status to Ridley's species.

Contrary to the usual practice, Ridley has the habit of stating, in his descriptions of *Calami*, the number of the transverse rows of scales on the fruits and in doing so he mentions the number of only those rows which appear to him very important. Hence he arrives at 5 as the number of rows in the fruits of *C. distans*, though so low a figure has not yet been noted in any *Calamus* fruits. This method of counting rows of the fruit scales is very misleading as there is no sure criterion by which the scales could be divided into two classes of major and minor importance; and, if one were to attempt to count all the transverse series of scales, much useful time would be wasted since the number thus obtained will be dependent on the development of the fruits and also of the apex, and even if fully developed fruits were available in every case, the method will not be serviceable for practical systematics as the minuteness of many of the scales will discourage botanists from making use of this character in systematic accounts. Hence it is desirable that only longitudinal series of rows should be mentioned in descriptions and these are not only easy to count and independent of the size of the fruits but they are also most useful in identification of rattans. The scales in the type of *C. distans* are arranged in 15-16 longitudinal series. The following specimens in the Singapore herbarium belong to this species.

MALAY PENINSULA: *Johore*, Gunong Berhidong, alt. 1,000 feet (Holttum 10974); Sungei Tebrau (Ridley, 9207). *Pahang*, Fraser Hill, alt. circ. 4,000 feet. (Burkill and Holttum, 8807); Sungei Yet on Fraser Hill, alt. 3,700 feet (Nur. 11,130). *Negri Sembilan*, Bukit Senaling at Kuala Pilah (Moorhouse, ver. name *Rotan Kerai* and *Rotan Perut Ayam*). *Perak*, Kinta Valley (Ridley, 9814); Taiping Hills (Ridley, 11,987). *Kelantan*, Gunong Sitong, alt. 900 feet (Nur with Foxworthy, 12,188, Type of *C. distans*).

The vernacular name *Rotan Perut Ayam* apparently belongs to the species *C. muricatus*, for it appears that, instead of writing the name on a different sheet Ridley put it through an error on the sheet on which the spadix of the *Rotan Kerai* was mounted. Both these specimens were sent by Moorhouse from Kuala Pilah.

As far as is known this species has not been recorded from Borneo. Ridley's statement (repeated by Merrill in *Enum. Bornean Pl.*, 1921. p. 75) that this species occurs in

Borneo is probably based on misidentification of the specimens of *C. muricatus*; in fact I have found some of the specimens of *C. luridus* put by Ridley in the cover of the former.

- ✓ 12. *Calamus muricatus* Becc. Nelle For. di Borneo. (1902) 609; Calc. Ann. XI (1908) 172 & pl. 33, & Suppl. (1913) 9.

✓ *C. luridus* Becc. *sensu* Ridl. Mat. Flor. Mal. Pen. II (1907) 198 et Flor. Mal. Pen. V (1925) 56 p.p. syn. nov.

MALAY PENINSULA: *Selangor*, Rawang (Ridley, 12118). *Negri Sembilan*, Bukit Senaling at Kuala Pilah (Moorhouse).

This species was hitherto regarded as endemic in Borneo.

The vernacular name *Rotan Perut Ayam*, quoted by Ridley under *C. luridus* apparently belongs to this species. Moorhouse had sent two Rotans from Bukit Senaling, one known as *Rotan Kerai* and the other *Rotan Perut Ayam*. Obviously through an error the label bearing the latter name found its place on the sheet on which the spadix of *Rotan Kerai* (*C. luridus*) was mounted.

- ✓ 13. *Calamus myriacanthus* Becc. in Rec. Bot. Surv. II (1902) 214; Calc. Ann. XI (1908) 251, pl. 85, et. Suppl. (1913) 38. (Type from Mount Matang, Borneo).

✓ *C. Hewittianus* Becc. in Calc. Ann. XI Suppl. (1913) 45 pl. 24 (Type from Mt. Matang). Syn. nov.

- ✓ *C. Jaherianus* Becc. in Calc. Ann. XI Suppl. (1913) 46 pl. 25 (Type from Dutch Borneo). Syn. nov.

I have had an opportunity of examining some authentic material named by Beccari himself and preserved at Kew, and as a result I come to the conclusion that the above three species are identical. The young flowers have a strongly striated calyx as is seen even in the specimen collected at Sioul by Hewitt in 1905, sub. n. 29 and identified by Beccari as the male of *C. myriacanthus* in the *Calcutta Annals Suppl.* l.c., as well as in another specimen also collected at Sioul by Hewitt in 1906 (or 1900?), sub. n. J.; but, as the flowers develop, these striations tend to disappear or remain only in the lowermost portion of the calyx. The young spadices of *C. myriacanthus* would therefore be *C. Jaherianus* which is described from a male spadix only (with no leaves and sheaths), though from the other characters given the latter is scarcely separable from the former. In the type of *C. Hewittianus* the leaves are juvenile and tend to be glaucescent as in the above named Sioul specimens, but it is hardly distinguishable from *C.*

*myriacanthus*. The leaf-sheath with a portion of stem is not represented in the type, though it is described and photographed by Beccari. As there are not even marks to show that it was mounted on the sheet I conclude that the portion was inadvertently placed on the sheet when the latter was being photographed and so Beccari may have been misled to make of the specimen thus constituted a new species quite distinct from *C. myriacanthus*.

**14. *Calamus polystachyus* Becc. Calc. Ann. XI (1908) 383 et in Suppl. (1914) 77.**

Beccari had described this species from the specimens gathered from a plant of uncertain origin, cultivated in the Buitenzorg Botanic Garden. Later he found in the Buitenzorg Herbarium a specimen that had a ticket which probably did not belong to the specimen, since, according to Beccari, it is unthinkable that Teysmann would name the specimen, even provisionally, as *Calamus rhomboideus* Bl., a name apparently entered up on the ticket by Teysmann himself. This being the case I do not understand why Beccari regarded the specimen as coming from Sumatra. In the absence of other signs or evidences to show that the specimen was collected in Sumatra, it is better, in my opinion, not to go by the locality given on a wrong label and, therefore, to disregard altogether the record of the species for Sumatra.

The species is, however, known to be wild in Borneo in the vicinity of Sandakan, where Ramos found it twice in 1920 (cf. Ramos nos. 1400 and 1788 distributed from Manila without any specific name). Ramos specimens bear fruits which, to complete Beccari's description, are here described:—

*Perianthium* fructiferum explanatum, profunde partitum. *Fructus* globoso-ovatus vel ovatus, 1.5 cm. (cum rostello 0.1 cm. longo) altus, 0.7-1 cm. in diam. *Squamæ* in orthostichis 12 dispositæ, stramineæ, in margine atratus vel non, dorsum secus canaliculatæ. *Semen* ambitu orbiculare vel ovoideum, 1 cm. longum, 0.8 cm. latum, 0.5 cm. crassum, fovea chalazali late concava, ceterum leviter sulcatum vel rugosum, extus albido-fibroso-tomentosum. *Albumen* albidum, homogeneous. *Embryo* basilaris.

BRITISH NORTH BORNEO: near Sandakan (Ramos. nos. 1400 et 1788).

This species is at once distinguished from all the others by the presence of two or three distinct spikelets at each secondary spathe in the lower part of the partial inflorescences. This and *C. aquatilis* Ridl. are the only species known to me to have a fibrous tomentose integument on the seeds. Beccari opines that this tomentose surface on



the seeds is due to the cellules of the integument persisting after the destruction of its fleshy part in drying. Like *C. aquatilis*, this species has leaflets which are finely spinulose along the costæ beneath, in which surface also it is provided with minute rusty scales. Were it not for the presence of more than one distinct spikelet in the axils of many secondary spathes it would not have been easy to separate this species from *C. aquatilis* Ridl. which also belongs to the same group (Group XIV of Beccari) though found only in the Malay Peninsula.

✓ 15. *Calamus rostratus* Furtado spec. nov.

*Caudex* scandens, ad 4 m. longus, cum vagina 2.5 cm. in diam. *Frondis vagina* flagellifera, oblique truncata, infra petiolum conspicue gibbosa vel geniculata, aculeis approximatis, valde applanatis, elasticis, patentibus, plus minus in seriebus obliquis vel transversalibus dispositis, ad 5 cm. longis, basi 0.6 cm. latis horride armata. *Ochrea* liguliformis, ligulis deciduis, ad basin aculeis ut in vagina, ad 15 cm. longis et 0.6 cm. latis, porrectis prædita. *Frondes* cirrho carentes, cum petiolo 1.50-1.75 m. longæ, utrinsecus segmentis 48-53, circ. 2 cm. inter se remotis. *Petiolus* 7-20 cm. longus, flavescens, supra concavus, subtus convexus, secus margines ambo aculeis regidis, solitariis, rarissime confluentibus, 0.4-3 cm. longis ad 0.4 cm. latis, in duabus seriebus obscuris dispositis, subtus dimidium petiolum secus aculeis solitariis, brevioribus, remotis armatus. *Rhachis* flavescens, subtus aculeis solitariis remote armata. *Segmenta* æquidistantia, alternantia vel subopposita, rarissime opposita, linearia, basi paulo cuneata, apicem sensim attenuatam, acuminatam, ad margines spinulosam terminata, supra costis 3, quarum media robustiora, glabra, alteris subprimariis spinulosis percurta, subtus costas secus spinulis quam facie superiore magis approximatis, minoribus armata, basilaria angustissima, media longissima circ. 30-35 cm. longa, 1.5-1.8 cm. lata, apicalia brevissima basi ad 1/6 connata. *Spadix foemineus* cum flagello apicali circ. 4 m. longus, duplo- vel subtriplo-ramificatus, unguibus 4-furcatis armatus. *Rami* primarii sæpissime 4, remoti, longe-pedunculati, pedunculo ad maximam partem spatha incluso; ramis secundariis circ. 15, sessilibus, ad spatharum orificium insertis, floriferis, 10-15 cm. longis, circ. 5-7 cm. inter se dissitis, rarissime ramificatis, ramis tertiariis 3-5 cm. longis. *Spathae* primariæ tubulosæ, aculeolatae, apicem versus sæpe fissæ, apice oblique truncatæ; secundariæ tubulosæ, oblique truncatæ, inermes vel aculeis rudimentariibus: *Spathellae* truncatæ, glabræ. *Involucrophorum* sessile; *involucrum* cupuliforme. *Perianthium* distincte pedicelliforme, apicem versus contractum, demum dilatatum et lobulatum; calyx corollæ æquilongus. *Fructus* nondum

plane maturus, ellipticus, cum rostro 0.2-0.3 cm. longo et caudiculo 0.1-0.15 cm. longo, 1.5-1.8 cm. altus, circ. 0.8 cm. in diam., utrinque contractus. *Squamæ* in vivo flavidae, in sicco badiæ, concolores (margine haud diversæ), in seriebus verticalibus 15-17 dispositæ. *Semen* ambitu ovoideo-ellipticum, utrinque rotundatum, 0.8-0.9 cm. longum, 0.6 cm. latum, 0.4-0.5 cm. crassum, fovea chalazali in dimidio latere impressum, in altero latere dense rugulosum. *Albumen* profunde ruminatum. *Embryo* basilaris.

*Planta mascula* ut fœminea, sed spiculis brevioribus, floribus magis approximatis, calyce quam corolla 0.4 cm. longa duplo minore, perianthio infra apicem non contracto differt.

BRITISH NORTH BORNEO: Kinabalu Mts. at *Tenompok*, alt. circ. 4,500 feet, female, abundant (legit Furtado, comm. Clemens sub. no. 28650. Type in Singapore); *ibid*, male plant (leg. Furtado, comm. Clemens sub no. 28844); *ibid*, alt. 5,000 feet Clemens, n. 28566 (bis) female spadix only, leaves of a different plant); *ibid* (Clemens no. 28375, female).

This species belongs to *Group IX* of Beccari and in certain respects approaches very near to *C. diepenhorstii* and *C. marginatus* Mart. From *C. Diepenhorstii*, *C. rostratus* differs by its longer spines on sheath and ochrea, the leaflets being more approximate, the terminal pair of the leaflets being somewhat united at base (and not free), perianth more pedicelliform, fruit scales being not (or obscurely) bicolorous and the seed not globular. From *C. marginatus* it differs in the longer spines on the sheath and ochrea, larger and rostrate fruits, reddish brown, concolorous (or obscurely bicolorous) scales and in its distinctly ruminant seeds. Owing to its indistinct ruminations Beccari was inclined to put *C. marginatus* in *Group V* rather than in *Group IX*, but in the absence of better developed seeds, I find it better to retain *C. marginatus* in *Group IX*. The bases of the primary branches of the spadix of *C. rostratus* are also included for a greater part in the upper part (often split) of the spathe. Similar arrangement has not been observed in the two above mentioned *Calami*. In the living state the petiole and leaf rhachis are coloured golden yellow. The stem is not used by the Dusuns for tying purposes.

#### ✓ 16. *Calamus stramineus* Furtado spec. nov.

*Caudex* scandens, circ. 7 cm. longus. *Frondis vagina*, ochrea et petiolus ignoti. *Frondes* magnæ ut videtur, cirrhiferæ, secus rhacheos dorsum unguibus armatæ. *Segmenta* ad 2 aggregata, gregibus oppositis vel fere

alternis, inæquidistantibus, lanceolata vel oblanceolata, utrinque attenuata, apice acuminata, basi acuta, 25-35 cm. longa, 4-5 cm. lata, 5-9-costulata, secus leviter plicata, costis et nervulis transversis utrinque sat distinctis, glabra, in margine spinulosa, supra viridia, subtus fere glauca. *Spadix foemineus* longus, flagelliformis ut videtur. *Spathae primariae* partim visæ, tubulosæ; secundariæ tubulosæ, truncatæ, glabræ, decidue furfuraceæ. *Spathellae* spathis secundariis similes, sed minores, apice plerumque ciliolatæ. *Rami primarii* circ. 30 cm. longi, in apicem sterilem, 2 cm. longum exeuntes, utrinsecus spiculis circ. 8. *Spiculae* 4-7 cm. longæ, sessiles, utrinsecus fructus 6-13 gerentes. *Involucrophorum* sessile vel subpedicelliforme. *Involucrum* cupuliforme. *Perianthium* fructiferum pedicelliforme, calyce corollæ æquilongo. *Fructus* elliptico-ovatus, utrinque rotundatus, summo abrupte rostratus, cum caudiculo 0.15 cm. et rostro 0.3 cm. longo 1.8 cm. altus, 1 cm. in diam. *Squamæ* stramineæ, secus marginem subconcolores, dorso canaliculatæ in orthostichis 15 dispositæ. *Semen* ovatum, 1 cm. longum, 0.6 cm. in diam., fere cylindricum, utrinque rotundatum, raphen secus prominens, ceterum irregulariter alveolatum vel rugosum. *Albumen* profunde ruminatum. *Embryo* lateralis, proxime basin situs.

BRITISH NORTH BORNEO: Kinabalu Mts. near Dallas, alt. circ. 3,000 feet (Clemens no. 27010. Type in Singapore) *ibid* (Clemens n. 26496).

Evidently belongs to the *Group XIII* of Beccari and appears to be very near to *C. spathulathus* and *C. palem-banicus*, but both these have seeds with homogeneous albumen. *C. Scipionum* has seeds with slight intrusions of the integuments in the albumen, but the leaflets here are equidistant (not arranged in groups). *C. densiflorus* bears distinctly ruminant seeds, but it has very narrow, linear, equidistant leaflets.

✓ **var. megalospermus** Furtado var nov. A forma typica recedit spadicebus robustioribus, fructibus majoribus, squamis in orthostichis 17-18 dispositis, semine in latere foveali sat applanato.

BRITISH NORTH BORNEO: Kinabalu Mts., near Dallas, alt. circ. 3,000 feet (Clemens no. 27009. Type in Singapore).

The leaves in this specimen are apparently from very young shoots or plants and bear no thorns on the rhachis. The leaflets which are arranged in groups of 1-4 are papery in texture, narrower than in the type, green, concolorous, oblanceolate suddenly narrowed into a long acuminate apex, 3-5 costulate, spinulose along the costæ above and along the margins. In the duplicate preserved in the Berlin herbarium and bearing this number there is no trace of any



cirrus on the leaf, but the Singapore specimen which has somewhat older leaflets bears a very thin, filiform hooked prolongation at the apex. The lowermost spathe (secondary spathe) of the partial inflorescence in the type specimen bears also stout recurved spines, a fact which makes me surmise that the spadix in this species is flagelliform.

17. *Calamus tenompokensis* Furtado spec. nov.

*Caudex* scandens vel semiscandens, circ. 5 m. longus, sine vagina circ. 1 cm. in diam. Frondis *vagina* flagello carens (semper?), sensum in petiolum transiens, in parte superiore ventrali longitudinem secus breviter aperta, aculeis plus minus in seriebus transversalibus dispositis, valde applanatis, tenuibus, patentibus, cinnamomeis ad 2 cm. longis armata, decidue ferrugineofurfuracea. *Ochrea* brevissima, aculeis rigidis armata, in speciminibus junioribus lobis papyraceis caducis, 8-10 cm. longis ornata. *Frondes* cirrho carentes, cum petiolo 1-1.50 m. longæ, utrinsecus segmentis 6-9. *Petiolus* circ. 80 cm. longus, subtus convexus, aculeis robustis, solitariis vel confluentibus, patentibus vel reflexis, dispersis armatus, supra glaber, paulo concavus; *rhachis* aculeis solitariis, rarissime confluentibus, recurvatis subtus armata, circ. 50-70 cm. longa. *Segmenta* distantia, circ. 30 cm. longa, 4.5-5 cm. lata, inferiora alternantia, robuste-papyracea, lato-lanceolata, maxima latitudine in dimidia vel supra sita, basi attenuata, plicata, apicem versus subito vel potius sat subito acuminata, ad margines parce spinulosa, utrinque glabra, 5-7-stulata, nervulis transversis distinctis; terminalia ad 2/3 confluentia, sequentia ambo opposita vel sub-opposita, jugo terminalio valde approximata. *Spadix foemineus* fronde minor, apice sæpe flagelliformis, ramis secundariis patentibus, fructiferis 5-7 cm. longis. *Spathae* primariæ basin versus spinulosæ, in parte basilare tubulosæ, ad ramorum basin in lobos liberos exeuntes, longitudinem secus irregulariter fissæ, primariæ et secundariæ decidue ferrugineo-furfuracæ. *Rami primarii et secundarii* ad spatharum orificium orientes. *Spathelae* truncatæ, furfuracæ. *Involucrophorum* sessile; involucrum calyculiforme. *Perianthium* explanatum, calyx quam corolla duplo vel subduplo brevior. *Fructus* ovoideus vel ellipsoideus utrinque rotundatus, apice in rostrellum 0.2 cm. longum abrupte productus, sine rostrello circ. 0.9 cm. longus, 0.7-0.8 cm. in diam. *Squamæ* stramineæ, apice fuscae, seriebus 18-21 verticalibus imbricatæ. *Semen* ambitum ellipsoideum, utrinque rotundatum, fovea chalazali laterali, nonnihil lateque impressum, ceterum applanatum, superficie sulcis latiusculis a fovea radiantibus pertensa, 0.7 cm. longum, 0.5 cm. latum, 0.4 cm. crassum. *Albumen* æquabile. *Embryo* in latere opposito proxime basin situs.

*Planta mascula* in frondibus ut foeminea. *Spadix* circ. 75 cm. longus, ramis primariis 5-7. *Spathae* et *spathellae* ut foemineae. *Spiculae* graciles, circ. 4.5-6 cm. longae, utrinsecus floribus circ. 15-20, distichis, alternantibus, valde approximatis. *Involucrophorum* sessile. *Calyx* tubulosus, trifidus, quam corolla 0.4 cm. longa subtriplo brevior.

BRITISH NORTH BORNEO: Kinabalu Mts: at *Tenompok*, towards Lumu Lumu, alt. circ. 5,500 feet (legit Furtado, comm. Clemens sub. no. 28408, female plant. Type in Singapore). *Ibid*, alt. circ. 4,500 feet (leg. Furtado, comm. Clemens sub. no. 29203, Male). *Ibid* towards Dallas, alt. circ. 4,000 feet (Clemens, no. 27339, male); *ibid*, alt. circ. 5,000 feet (Clemens, no. 27899, male).

This species belongs to Beccari's *Group VI* and is closely related to *C. myriacanthus* Becc which, however, has free apical leaflets, rusty scales on its petiole, rachis, and spathe and only rudimentary thorns or none at all on the spadices. The male spikelets in *C. myriacanthus* are also very much shorter. *C. ramosissimus* Griff. also bears some resemblance to *C. tenompokensis*, but the former is distinguished from the latter by its more numerous, leaflets, and by its leaves terminating into 3 (not 4) leaflets which are, moreover, always free to the base, whereas the two terminal leaflets in the other species are always connate.

#### INDEX TO THE COLLECTORS' NUMBERS

The Roman number following a collector's number indicates the species bearing that number in this paper. Thus "Clemens 26,496-XVI" means that the specimen bearing Clemens no. 26,496 is quoted under *Calamus stramineus*.

BURKILL—s.n. (from Pulau Tioman)—II.

BURKILL AND HANIFF—13,446-VI; 13,451-VI.

BURKILL AND HOLTUM—8,807-XI.

CLEMENS—26,496-XVI; 27,009-XVI var; 27,010-XVI;  
27,339- and 27,899-XVII; 28,375-XV;  
28,408-XVII; 28,566-XV; 28,650-XV;  
28,844-XV; 29,195-VIII; 29,198 and  
29,198a-IV; 29,203-XVII.

HANIFF—14,252-VI; 15,910-X; (Langkawi) s.n.-X.

HENDERSON—18,465-II.

HOLTUM—10,974-XI; 15,211-II.

KJELLBERG—2,367-IX; 2,398-VII; 2,649-I.

MOORHOUSE—(from Kuala Pilah) s.n.- XI and XII.

NUR—11,130 and 12,188-XI.

RAMOS—1,400 and 1,788-XIV.

RIDLEY—(from Matang) s.n.-III; 9,207- and 9,814-XI;  
11,215-V; 11,987-XI; 12,118-XII; 13,921-  
VI.